

US EPA RECORDS CENTER REGION 5



469070

Handbook of
Toxic and Hazardous
Chemicals and
Carcinogens
Second Edition

Marshall Sittig

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HANDBOOK OF TOXIC AND HAZARDOUS CHEMICALS AND CARCINOGENS

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by

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ABOUT THE AUTHOR

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DOT Designation: Nonflammable gas.

Potential Exposures: Argon is used as an inert gas shield in arc welding; it is used to fill electric lamps. It is used as a blanketing agent in metals refining (especially titanium and zirconium).

Permissible Exposure Limits in Air: There is no Federal standard. ACGIH lists argon as a simple asphyxiant with no specified TLV.

Permissible Concentration in Water: No criteria set.

Routes of Entry: Inhalation and possibly skin contact with liquid argon.

Harmful Effects and Symptoms: The gas is a simple asphyxiant as noted above. The liquid can cause frostbite.

Disposal Method Suggested: Vent to atmosphere.

References

- (1) Sax, N.I., Ed., *Dangerous Properties of Industrial Materials Report*, 1, No. 5, 36-37, New York, Van Nostrand Reinhold Co. (1981).

ARSENIC AND ARSENIC COMPOUNDS

- Carcinogen (IARC) (11)
- Hazardous substances (Some compounds, EPA)
 - Arsenic compounds classified by EPA as hazardous substances are: arsenic disulfide, arsenic pentoxide, arsenic trichloride, arsenic trioxide and arsenic trisulfide. Also the EPA has issued rebuttable presumptions against registration (RPAR's) for several arsenic-containing pesticides as follows: arsenic acid, cacodylic acid, calcium arsenate, DSMA, lead arsenate, MSMA and sodium arsenite.
- Hazardous waste constituents (EPA)
- Priority toxic pollutant (EPA)

Description: As, elemental arsenic, occurs to a limited extent in nature as a steel-gray metal that is insoluble in water. Arsenic in this discussion includes the element and any of its inorganic compounds excluding arsine. Arsenic trioxide (As_2O_3), the principal form in which the element is used, is frequently designated as arsenic, white arsenic, or arsenous oxide. Arsenic is present as an impurity in many other metal ores and is generally produced as arsenic trioxide as a by-product in the smelting of these ores, particularly copper. Most other arsenic compounds are produced from the trioxide.

Code Numbers: (Element) CAS 7440-38-2 RTECS CG0525000 UN 1558

Type of Compound/Label Designation: Poison.

Synonyms: None.

Potential Exposure: Arsenic compounds have a variety of uses. Arsenates and arsenites are used in agriculture as insecticides, herbicides, larvicides, and pesticides. Arsenic trichloride is used primarily in the manufacture of pharmaceuticals. Other arsenic compounds are used in pigment production, the manufacture of glass as a bronzing or decolorizing agent, the manufacture of opal glass and enamels, textile printing, tanning, taxidermy, and antifouling paints. They are also used to control sludge formation in lubricating oils. Metallic

arsenic is used as an alloying agent to harden lead shot and in lead-base bearing materials. It is also alloyed with copper to improve its toughness and corrosion resistance.

EPA estimates that more than 6 million people living within 12 miles of major sources—copper, zinc, and lead smelters—may be exposed to 10 times the average U.S. atmospheric levels of arsenic. The agency says that 40,000 people living near some copper smelters may be exposed to 100 times the national atmospheric average.

Permissible Exposure Limits in Air: The Federal standard for arsenic and its compounds was previously 0.5 mg/m^3 of air as As. In 1973, NIOSH proposed (1) the lower recommended standard of 0.05 mg As/m^3 of air determined as a time-weighted average (TWA) exposure for up to a 10-hour workday, 40-hour workweek. Then, in November 1975, OSHA proposed a workplace exposure limit for inorganic arsenic at $4 \text{ } \mu\text{g/m}^3$ (8-hour, TWA). The economic impact of such a standard has been assessed (2). The previous standard of $500 \text{ } \mu\text{g/m}^3$ for all forms of arsenic would remain in effect only for organic forms.

A 1975 NIOSH document (3) proposed that inorganic arsenic be controlled so that no worker is exposed to a concentration of arsenic in excess of 0.002 mg/m^3 ($2.0 \text{ } \mu\text{g}$) as determined by a 15-minute sampling period. Finally in 1978 a standard was promulgated (4) which limits occupational exposure to inorganic arsenic to $10 \text{ } \mu\text{g/m}^3$ ($\mu\text{g/m}^3$ of air) based on an 8-hour time-weighted average.

The ACGIH (1983/84) TWA value for arsenic and soluble compounds (as As) is 0.2 mg/m^3 . Arsenic trioxide production is categorized as "suspect of carcinogenic potential for man." As a first step toward regulating industrial emissions of inorganic arsenic, EPA has listed the substance as a hazardous air pollutant, as defined under the Clean Air Act and the agency's proposed airborne carcinogen policy.

Determination in Air: Collection on a filter and analysis by atomic absorption spectrometry (A-1). See also (A-10).

Permissible Concentration in Water: To protect freshwater aquatic life—total recoverable trivalent inorganic arsenic never to exceed $440 \text{ } \mu\text{g/l}$. To protect saltwater aquatic life— $508 \text{ } \mu\text{g/l}$ on an acute basis. To protect human health—preferably zero. A value of $0.02 \text{ } \mu\text{g/l}$ corresponds to a human health risk of 1 in 100,000. EPA has established a maximum arsenic level of 0.05 mg/l . This does not address carcinogenicity and is under review.

Allowable arsenic levels in drinking water have also been set as follows (A-65):

South African Bureau of Standards	0.05 mg/l
World Health Organization	0.05 mg/l
Federal Republic of Germany (1975)	0.04 mg/l

Determination in Water: Total arsenic may be determined by digestion followed by silver diethyldithiocarbamate; an alternative is atomic absorption; another is inductively coupled plasma (ICP) optical emission spectrometry.

Routes of Entry: Inhalation and ingestion of dust and fumes.

Harmful Effects and Symptoms: *Local* — Trivalent arsenic compounds are corrosive to the skin. Brief contact has no effect, but prolonged contact results in a local hyperemia and later vesicular or pustular eruption. The moist mucous membranes are most sensitive to the irritant action. Conjunctiva, moist and macerated areas of the skin, eyelids, the angles of the ears, nose, mouth, and respiratory mucosa are also vulnerable to the irritant effects. The wrists

MBT are alkaline and, therefore, are more dangerous to skin contact and breathing of any spray. Protective rubber clothing are recommended in addition to the suggestions above. Also, an eye wash should be available at the handling site.

First Aid: Respirators approved by the U.S. Bureau of Mines are recommended in the event of a spill of the compounds. Otherwise, no special handling instructions are recommended for these compounds, other than those in "First Aid" above also.

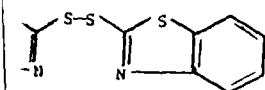
Personal Protective Methods above.

Disposal: The recommended disposal method is by incineration unless provision can be made to ensure that no mercury will not be emitted to the atmosphere.

Agency, *Investigation of Selected Potential Environmental Hazards from Benzothiazoles*, Report EPA-560/2-76-006, Washington, DC (June 1976).

ZOTHIAZOLE DISULFIDE

Chemical structural formula



Needle-like crystals melting at 180°C.

RTECS DL4550000

Uses: Dithiazole; Dithiazyl disulfide, MBTS. It is involved in MBTS manufacture or use as a stabilizer. Data indicate that 72,000 workers may be exposed.

First Aid: No standards set.

Prevention: No criteria set.

Control: Dust and vapors.

Health Effects: Causes skin and mucous membrane irritation. Prolonged inhalation may cause lung inflammation. Reproductive disorders have been noted in animals. It puts a stress on the nervous system. Irritates membranes, lungs.

Chemical Hazard Information Profile, Washington, DC (May 27, 1983).

MERCURY-ALKYL AND ARYL

- Hazardous waste (phenylmercury acetate)(EPA)
- Priority toxic pollutant (methylmercury, EPA)

Description: Methylmercury compounds—methylmercury dicyandiamide, $(CH_3)_2HgNHC(NH)NHCN$, soluble in water. Ethylmercury compounds—ethylmercuric chloride, C_2H_5HgCl , insoluble in water; ethylmercuric phosphate, $(C_2H_5HgO)_2PO_4$, soluble in water; N-(ethylmercuric)-p-toluenesulfonanilide, $C_2H_5N(HgC_2H_5)SO_2C_6H_4CH_3$, practically insoluble in water. Phenylmercury compounds—phenylmercuric acetate, slightly soluble in water.

Code Numbers:

Methylmercury dicyandiamide	CAS 502-39-6	RTECS OW1750000	UN 2777
Ethylmercuric chloride	CAS 107-27-7	RTECS OV9800000	UN 2777
Phenylmercuric acetate	CAS 62-38-4	RTECS OV6475000	UN 2777

DOT Designation: Poison B

Synonyms: Methylmercury Compounds – Methylmercury Dicyandiamide: Cyano(methylmercury)guanidine, Panogen®.

Ethylmercury Compounds – Ethylmercuric chloride, Ceresan®, ethylmercuric phosphate, New Ceresan®, and N-(ethylmercuric)-p-toluenesulfonanilide, Ceresan M®.

Phenylmercury Compounds – Phenylmercuric acetate, PMA.

Potential Exposure: These compounds are used in treating seeds for fungi and seedborne diseases, as timber preservatives, and disinfectants.

The aryl mercury compounds such as phenylmercury are primarily used as disinfectants, fungicides for treating seeds, antiseptics, herbicides, preservatives, mildewproofing agents, denaturants for ethyl alcohol, germicides, and bactericides.

Incompatibilities: Strong oxidizers such as chlorine.

Permissible Exposure Limits in Air: The Federal standard is 0.01 mg/m³ as an 8-hour TWA with an acceptable ceiling of 0.04 mg/m³.

The ACGIH has set a TWA of 0.01 mg/m³ and an STEL of 0.03 mg/m³ for mercury alkyls. A TWA of 0.1 mg/m³ (but no STEL) value has been proposed for aryl mercury compounds by ACGIH as of 1983/84. The IDLH level is 10 mg/m³ for mercury alkyls.

Determination in Air: Collection on solid sorbent followed by determination of flameless atomic absorption spectrophotometry (A-10).

Permissible Concentration in Water (Methylmercury): To protect freshwater aquatic life—0.016 µg/l as a 24-hr average, never to exceed 8.8 µg/l. To protect saltwater aquatic life—0.025 µg/l as a 24-hr average, never to exceed 2.8 µg/l. To protect human health—0.2 µg/l.

Determination in Water: Flameless atomic absorption.

Routes of Entry: Inhalation of dust, percutaneous absorption.

Harmful Effects and Symptoms: Local – Alkyl mercury compounds are primary skin irritants and may cause dermatitis. When deposited on the skin, they give no warning, and if contact is maintained, can cause second-degree burns. Sensitization may occur.

Systemic – The central nervous system, including the brain, is the principal